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LUNALILO PARK SUBDIVISION UNIT V-A - PRELIMINARY SOIL REPORT  
(for residential development)

MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-05

To:  
PARK ENGINEERING, INCORPORATED

By:  
WALTER LUM ASSOCIATES, INCORPORATED  
CIVIL, STRUCTURAL, SOILS ENGINEERS  
May 1, 1967

MUNICIPAL REFERENCE & RECORDS CENTER  
City & County of Honolulu  
City Hall Annex, 555 S. King Street  
Honolulu, Hawaii 96813

**WALTER LUM ASSOCIATES, INC.**  
**CIVIL, STRUCTURAL, SOILS ENGINEERS**

WALTER LUM  
EDWARD WATANABE  
EZRA KOIKE

1019-A UNIVERSITY AVENUE • HONOLULU, HAWAII • PHONE 990-471

May 1, 1967

MR. EDWARD PARK  
Park Engineering, Inc.  
1149 Bethel Street, Room 710  
Honolulu, Hawaii 96813

Dear Mr. Park:

Subject: Lunaliilo Park Subdivision Unit V-A  
Preliminary Soil Report  
(for residential development)  
Chapter 23, Revised Ordinances of Honolulu,  
1961 As Amended

In accordance with your request, a preliminary soil exploration was made at the proposed residential development site for the Lunaliilo Park Subdivision Unit V-A at Maunaloa, Oahu, Hawaii, Tax Map Key: 3-9-05.

From the field exploration and laboratory test results, it is our opinion that the site may be used for a residential housing development. Houses can be supported either directly on stiff existing ground or on properly compacted fills constructed from suitable on-site soils.

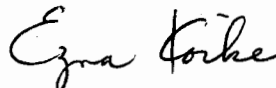
Unforeseen or undetected conditions such as soft spots or seepage water may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

All earthwork should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended and the recommendations contained herein.

The report includes a Boring Location Plan, boring logs, laboratory test results and recommendations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.



Ezra Koike  
Professional Engineer  
Hawaii No. 1450

EK:es

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LUNALILO PARK SUBDIVISION UNIT V-A - PRELIMINARY SOIL REPORT  
(for residential development)

MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-05

SCOPE OF EXPLORATION

The purpose of this exploration was to determine soil conditions of the proposed site, Lunalilo Park Subdivision Unit V-A at Maunaloa, Oahu, Hawaii, for residential development.

This report includes field exploration, laboratory tests and recommendations regarding the soils at the site.

FIELD EXPLORATION

Fifteen borings were made at the site. The locations of these borings are shown on Figure 1, Boring Location Plan. Descriptions of the underlying soils are shown on Boring Logs Nos. 1 thru 15.

Disturbed and exploratory 2-in. thin-wall-tube samples were taken during the boring operation. Soil samples were visually identified and tentatively classified in the field. In the laboratory, they were subjected to appropriate tests. The field identifications and classifications were then reviewed and modified to conform with the results of the laboratory tests in accordance with the "Unified Soil Classification System."

### LABORATORY TESTS

Laboratory tests included: in-place natural density, moisture content and unconfined compression; Atterberg limits; specific gravity; gradation; expansion and CBR.

A list of the standard field and laboratory test methods used for this project is attached.

A summary of the laboratory test results is given in Tables IA and IB.

### SITE AND SOIL CONDITIONS

The project site is located on the lower slopes of Koko Crater along the Lunalilo Home Road. The southwestern portion of the site is an abandoned residential area. The southern portion of the site is covered with existing houses. The central portion of the site is cultivated land. The remaining land is undeveloped and covered with vegetation.

The land generally slopes downward from the lower slopes of Koko Crater towards the Lunalilo Home Road with grades varying from 4 to 12 per cent. From the field explorations and laboratory test results, the soil conditions at the site may be generally described as follows: a surface layer 5 to 16 ft of medium to very stiff, brown silt and clay (ML and MH) underlain by layers of stiff, yellowish-brown silt or volcanic tuff with degrees of hardness. For more detailed descriptions, refer to the boring logs.

Water was encountered at Borings Nos. 1, 2, 5 and 6 from about 12 to 15 ft below the existing ground surface.

In general, the proposed grading at this time is to use cut or fill slopes of less than 20 ft in height.

In the opinion of the Soil Engineer, the on-site soils have sufficient strength to support the fills and the light residential structures proposed.

#### DISCUSSION AND RECOMMENDATIONS

##### Fills

In general, the on-site soils are suitable for the construction of the proposed fills. The construction of the proposed fills should be done as required by the F.H.A. Data Sheet 79-G; Revised Ordinances of Honolulu, 1961 As Amended; and as recommended below:

1. Topsoil and stockpiled soils should be either (a) stripped to stiff natural ground or (b) scarified and recompacted before the placement of fills.
2. All hard surfaces along existing access roads should be scarified down to stiff soil and recompacted to match the density of the surrounding soil.
3. Where fills are proposed, the bottom and the sides of irrigation ditches should be stripped down to stiff natural ground and recompacted to match the density of the surrounding soil.

4. All fills should be constructed in approximately level layers starting at the lower end and working upward.
5. All fills should be laid in 6-in. compacted layers with a relative density of at least 90% of AASHTO T-180-57 density.
6. Old cesspools should be accurately located on the grading plan and properly backfilled before any grading work is started. The recommended procedure for proper backfilling is outlined in the "Proposed Specification for Earthwork."

#### Slopes

Cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

Slope adjustments or other precautions may be necessary if seepage zones or soft spots are encountered in localized areas.

If slope heights (top to toe) greater than 25 ft are considered, 8-ft-wide benches should be placed at height intervals of about 25 ft in both cuts and fills. The soil engineer should be advised of any cut or fill slopes higher than 20 ft.

For protection against erosion during construction, it is recommended that runoff water from rainstorms be controlled by berms or other approved methods.

The surface of fill slopes should be compacted with a sheepsfoot roller or by cat-tracking.

Slope planting is recommended on cut and fill slopes to minimize erosion. For this project, common Bermuda grass (manienie) is recommended. The planting process may be either by hand sprigging or by the hydro-mulch seeding process or by comparable methods.

It is estimated that continued initial maintenance of about 30 days will normally produce 60 to 90 per cent coverage. After the initial maintenance period, the Bermuda grass will normally produce a coverage of permanent planting in about 3 months.

For planting guidance, see the attached "Proposed Specification for Slope Control Planting."

#### Foundations

If earthwork is carried out as specified, the stiff natural ground and properly constructed fill should develop adequate bearing values to support the proposed light residential structures. Some recommendations for foundation construction are:

1. Bearing values for a given soil usually vary with the size and depth of the footings. For the proposed light structures, bearing values of 2000 p.s.f. on compacted fills and 3000 p.s.f. on stiff undisturbed ground may be used.



2. Because of the downhill creep effect of soils on a slope, some settlement may occur near the tops of slopes. Therefore, for slopes of about 15 ft or more in height, buildings should be placed about 15 ft from the tops of slopes. This distance may be proportionately reduced for lower slope heights, e.g., 10 ft for 10-ft-high slopes, but in no case should it be closer than 5 ft from the top of a slope.
3. Construction of retaining walls on side slopes should be avoided unless the underlying materials are very stiff or hard.
4. Good surface drainage away from the foundations of the proposed structures should be maintained.

#### Pavements

In general, a rough estimate of the roadway pavement thickness for the light residential traffic anticipated is as follows:

1. Wearing course - 2 in. asphaltic concrete.
2. Base course - 6 in. base course over a prepared subgrade.

Local adjustments regarding subbase requirements can be made in the field as conditions are encountered at subgrade levels.

It is recommended that the subgrades of roadways and parking areas be compacted and shaped to drain. Outlets should be placed at low points of roadway and parking area profiles to avoid water pocketing by running bleeder pipes into catch basins at low points of the subgrade.

PROPOSED SPECIFICATION FOR EARTHWORK

LUNALILO PARK SUBDIVISION UNIT V-A

General Description

This item shall consist of all clearing and grubbing, removing of existing structures, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and all subsidiary work necessary to complete the grading.

Clearing, Grubbing and Preparing Areas to be Filled

All vegetation and rubbish shall be removed and disposed of, leaving the disturbed areas with a neat, debris-free appearance.

All vegetable matter shall be removed from the surface upon which fill is to be placed. All topsoil and stockpiled soils shall be (1) stripped to stiff natural ground or (2) scarified and recompacted before the placement of fills. All topsoil encountered at finish grade shall be scarified and recompacted.

All hard surfaces along the existing access roads shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil.

Where fills are proposed, all loose material along the bottom and the sides of irrigation ditches shall be stripped down to stiff natural ground and recompacted to match the density of the surrounding soil.

Where fills are made on sloping areas steeper than 5 horizontal to 1 vertical, the ground at the toe of the slope shall be benched to a

generally level condition. As the fill is brought up, it shall be continually keyed into the stiff natural ground by cutting steps into the hillside and compacting the fill into these steps. Ground slopes which are flatter than 5 horizontal to 1 vertical shall be benched when considered necessary by the Soil Engineer.

#### Materials

Fill material shall consist of on-site soils approved by the Soil Engineer and identified in a soil report accepted by the F.H.A. The soils shall contain no more than a trace of organic matter and no particles larger than 6 in. in diameter. Also, it shall contain no more than 40% gravel (#4 sieve to 3 in. sieve sizes) and no more than 10% cobbles larger than gravel and smaller than 6 in. in diameter. Fill material placed in the top 2 ft of fills shall contain no more than 30% gravel and any material larger than gravel.

#### Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and thoroughly blade-mixed during the spreading to insure uniformity of material and moisture content within each layer.

No rocks or cobbles shall be allowed to nest and all voids between rocks must be carefully filled and compacted with small stones or earth.

When the moisture content of the fill material is below that specified by the Soil Engineer, water shall be added until the moisture content is as specified and assures a thorough bonding during the compacting process.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to no less than 90% of maximum density in accordance with AASHTO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is at the specified moisture content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to insure the obtainment of the desired density.

Field density tests shall be made by the Soil Engineer of the compaction of each layer of fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density reading shall be taken in the compacted material below the disturbed surface as often as necessary as determined by the Soil Engineer. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers, as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

#### Backfill of Old Cesspools

The following procedures shall be followed for backfilling:

(1) Sludge Removal

Remove the sludge from the bottom of the old cesspool  
by (a) pumping or (b) by clamshell or any other suitable

way. The material shall be disposed of away from the site. The completeness of removal shall be verified by probing and shall be less than 12 in. at the bottom.

(2) Granular Fill (below 3 ft from finish grade)

Use granular material, uniformly graded from 6 to 0 inches. The fines passing the No. 200 sieve shall be less than 10%. The materials shall be placed in thin layers (12 in. maximum) and compacted with vibratory equipment to 90% of AASHTO T-180-57 density. Ramming each layer into place with a clamshell bucket will be allowed. The granular fill shall be wetted before placement into the cesspools. Sufficient compaction tests shall be conducted to verify that 90% compaction is obtained by the construction method selected.

(3) Top 3 Ft of Fill

Linings encountered in the cesspool within the top 3 ft from finish grade shall be removed. The fill within the top 3 ft from finish grade shall be constructed from on-site soil in thin layers (6-in. compacted thickness) to 90% of AASHTO T-180-57 density. The material at finish grade shall blend with the surrounding soil.

### Excavation

Should any unforeseen critical soil formations be encountered at or near finish grades in cut areas, additional investigations shall be made by the Soil Engineer. Corrective measures shall be evaluated and field adjustments shall be made in these areas.

Suitable material from excavation shall be used in the fill and all unsuitable material from excavation shall be disposed of.

### Soil Engineering Services

The Soil Engineer shall observe the filling and compacting operations and make necessary tests in accordance with the specifications.

### Rainy Weather

No fill material shall be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests by the Soil Engineer indicate that the moisture content and density are as previously specified.

PROPOSED SPECIFICATION FOR SLOPE CONTROL PLANTING  
BERMUDA GRASS

LUNALILO PARK SUBDIVISION UNIT V-A

General Description

The Contractor shall provide all materials, equipment and labor necessary to complete the work. Slope control planting shall consist of hand sprigging or hydro-mulch seeding, fertilizing graded and disturbed areas, and shall include continuous care and maintenance in accordance with these specifications.

Materials

Seed

Permanent grass seed for hydro-mulching shall be hulled Bermuda grass (*Cynodon dactylon*). Seed quality shall have a minimum purity of 85%, minimum germination of 80%, and weed content not exceeding 1/2%.

Sprigs

Sprigs for hand planting shall be freshly dug, live vigorous common Bermuda grass (*manienie*). Sprigs shall have runners approximately 4 in. in length with well-developed root systems. They shall be free of foreign seeds, roots, plants and grasses, and shall be protected against drying out prior to planting.

Fertilizer

Commercial fertilizer for sprigging or hydro-mulching shall be 10-30-10 for use during both the grassing operation and the maintenance period.

### Mulch

Mulch for hydro-mulching shall be specially processed fiber containing no growth or germination inhibiting components. After addition and agitation in the hydraulic equipment with fertilizers, grass seed, water, and other additives not detrimental to plant growth, the fibers shall form a homogeneous slurry. When hydraulically sprayed on the soil, the fibers shall form a blotter-like ground cover which readily absorbs water and allows infiltration to the underlying soil.

### Water

1. Water shall be furnished to the Contractor if existing water lines service the area.
2. If water is not available on the jobsite or if there is insufficient volume or pressure to perform grassing and maintenance operations, the Contractor shall supply all water required.
3. The Contractor shall furnish all labor, materials and equipment necessary to install all temporary water lines, valves, etc., and upon completion of the work shall remove all such equipment.

### Planting Methods

#### Soil Preparation

1. The top layer of soil on the slope face shall be fertile and shall permit a normal growth of grass. It shall be free of extraneous materials harmful to plant growth.



2. Slope areas incapable of supporting plant growth shall have topsoil spread and compacted prior to grassing operations.
3. The soil profile shall be wetted to a depth of 4 to 6 inches.

#### Fertilizing

Apply fertilizer (10-30-10) evenly onto the soil surface at the minimum rate of 1,000 lbs per acre.

#### Planting by Sprigging

1. Apply fertilizer, as specified, to slope surfaces prior to sprigging.
2. The grass shall be sprigged 6 to 8 in. apart over the area and immediately covered with soil and then tamped.

#### Planting by Hydro-mulching

1. The seed, fertilizer (as specified), and mulch shall be applied with approved hydraulic equipment.
2. The seed shall be applied at a minimum rate of 2 lbs per 1,000 sq ft.
3. Mulch shall be applied at a minimum rate of 1,000 lbs per acre.
4. Areas inaccessible to hydro-mulching application shall be seeded, fertilized, and mulched by approved hand methods.

#### Maintenance

##### Initial

Maintenance shall commence simultaneously with hand sprigging or hydro-mulching operations and includes watering, fertilizing, insect and disease control, and protection.

### Watering

1. After planting, the ground shall be continuously kept moist for the first 14 days.
2. When the grass begins to cover, reduce the frequency of watering and increase the length of the watering period.
3. Watering shall be done in a manner that will prevent erosion due to excessive application of water. Watering equipment shall be of a type that will prevent damage to the planted areas.

### Fertilizing

1. The first maintenance application of 10-30-10 fertilizer shall be applied 14 to 21 days after planting at the rate of 400 lbs per acre.
2. Apply a second application of 10-30-10 fertilizer again 14 to 21 days thereafter.

### Insect and Disease Control

Regular inspections shall be made; if required, suitable insecticide or fungicide treatment shall be applied.

### Protection

Planted areas shall be protected against traffic by providing proper safeguards as needed. Repair and replant damaged areas promptly.

### Acceptance

#### Repair

The Contractor shall replant and fertilize areas failing to show sufficient growth to produce a satisfactory stand of grass at the time of final inspection.

#### Completion

Maintenance of the plant material shall continue until the specified percentage of plant coverage is established uniformly on the cut and fill slopes and approved by the Slope Control Specialist or the Landscape Architect.

PROPOSED SPECIFICATION FOR BASE COURSE

LUNALILO PARK SUBDIVISION UNIT V-A

Materials

The base course for use under floor slabs shall consist of clean crushed rock, gravel, coral, cinders or other material as approved by the Soil Engineer. It shall be free from adobe, organic matter, and other such deleterious substances.

Grading

The base course material shall have the following gradation:

<u>Sieve</u>	<u>% Passing</u>
2" Sq.	100%
#4	0

Compacting

The base course material shall be thoroughly compacted with vibratory or other approved equipment.

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ABORING NO.        Sheet No.        of       Driller WALTER LUM ASSOC. Date 2-23-67LOCATION MAUNALUA, OAHU, HAWAIIField Party MAKAULA, MAKISHI, GLORYTMK: 3-9-05Type of Boring AUGER (McCULLOCH) Diam. 3"

HAMMER:

Elev. 10 ± \* Datum       Weight 10 lb. SLEDGE HAMMERDrill Bit       Drop       Water Level 12.0'Time 1:30 PMSAMPLER: 2" O.D. THIN WALL TUBEDate 2-23-67

## PENETRATION DATA

2" O.D. THIN  
WALL TUBE  
SAMPLER  
BLOWS/0.5'  
W/10 lb. SLEDGE  
HAMMER

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot				
										0	10	20	30	40
ML	MEDIUM TO STIFF BROWN, SILTY CLAY W/ DECOMPOSED ROCK			I-A	106	31	81	5200	-					
MH	VERY STIFF TANNISH BROWN SILTY CLAY			I-B	109	51	72	13,000+	-					
MH	VERY STIFF TANNISH BROWN SILTY CLAY W/ DECOMPOSED ROCK & GRAVEL	5		I-C	-	34	-	-	-					
ML	MEDIUM TO STIFF GRAYISH BROWN SANDY SILT	10		I-D	-	63	-	-	-					
	DENSE DARK GRAY SAND	15		I-E	130	30	100	-	-					

\* ELEVATION ESTIMATED  
FROM CONTOUR PLAN

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## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-A

LOCATION MAUNALUA, OAHU, HAWAII

TMK : 3-9-05

**HAMMER:**

Weight. 10 lb. SLEDGE HAMMER

Drop\_\_\_\_\_

SAMPLER: 2" O.D. THIN WALL TUBE

BORING NO. 2 Sheet No. 1 of 1

Driller WALTER LUM ASSOC. Date 2-23-67

Field Party MAKAULA, MAKISHI, GLORY

Type of Boring AUGER (McCULLOCH) Diam. 3"

Elev. 16' ± \* Datum —

Drill Bit \_\_\_\_\_

Water Level 14.5'

Time 11:00 AM

Date 2-23-67

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA									
										Blows	Per Foot	0	10	20	30	40			
	ELEV. = 16' ± *																		2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' W/10 LB. SLEDGE HAMMER
ML	STIFF TO VERY STIFF BROWN, SILTY CLAY			2-A	105	33	79	13,000+	-										4 1/5' 15 1/5'
				2-B	116	30	89	13,000+	-										15 1/5' 20 1/3'
MH	STIFF TANNISH BROWN SILTY CLAY W/DECOMPOSED ROCK	5		2-C	91	42	64	2390	-										10 1/5' 14 1/5'
ML	STIFF GRAYISH BROWN SANDY SILT W/GRAVEL	10		2-D	107	31	82	-	-										10 1/5' 10 1/5'
	DENSE DARK GRAY, SAND	15	W.L.	2-E	(NO RECOVERY)														10 1/5' 8 1/5'
		20		2-F	(NO RECOVERY)														13 1/5' 27 1/5'
* ELEVATION ESTIMATED FROM CONTOUR PLAN																			

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAKAULA, OAHU, HAWAIIBORING NO. 3 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 2-24-67Field Party MAKAULA, GLORY, RACUYAType of Boring AUGER (McCULLOCH) Diam. 3"Elev. 17.5' ± \* Datum —Drill Bit —Water Level NOT ENCOUNTEREDTime —Date 2-24-67

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —SAMPLER: 2" O.D. THIN WALL TUBE

## PENETRATION DATA

2" O.D. THIN  
WALL TUBE  
SAMPLER  
BLOWS/0.5'  
W/10 lb. SLEDGE  
HAMMER

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot	0	10	20	30	40
	MEDIUM TANNISH BROWN SANDY SILT W/GRAVEL & DECOMPOSED ROCK														
	STIFF TO VERY STIFF REDDISH BROWN CLAYEY SILT W/ DECOMPOSED ROCK														
ML	STIFF REDDISH BROWN SILTY CLAY W/ DECOMPOSED ROCK	10		3-A	113	44	78	12,500	—						5/5' 5/5'
ML	STIFF TO VERY STIFF YELLOWISH BROWN SANDY SILT W/ DECOMPOSED ROCK			3-B	100	50	67	2600	—						8/5' 15/5'
ML	MEDIUM TO STIFF LIGHT BROWN, SILT W/TRACES OF DECOMPOSED ROCK	15		3-C	107	53	70	4170	—						5/5' 5/5'
	DENSE TO VERY DENSE GRAY, GRAVELLY SAND			3-D	125	25	100	—	—						30/5'
	GRAY DECOMPOSED ROCK			3-E	—	41	—	—	—						25/1'

\*  
ELEVATION ESTIMATED  
FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 4 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 2-24-67Field Party MAKAULA, GLORY, RACUYAType of Boring AUGER (McCULLOCH) Diam. 3"Elev. 25 ± \* Datum —Drill Bit —Water Level NOT ENCOUNTEREDTime —Date 2-24-67

## PENETRATION DATA

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot					2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' W/ 10 lb. SLEDGE HAMMER
										0	10	20	30	40	
MH	MEDIUM TANNISH BROWN SILTY CLAY W/ DECOMPOSED ROCK			4-A	104	26	82	3390	—						4 1/5' 7 1/5'
	BROWN DECOMPOSED ROCK	5		4-B	109	17	93	—	—						5 1/5' 6 1/5'
				4-C	117	32	89	—	—						7 1/5' 14 1/5'
MH	VERY STIFF TANNISH BROWN SILTY CLAY	10		4-D	105	42	74	8850	—						25 1/5' 25 1/3'
ML	MEDIUM LIGHT GRAYISH BROWN SANDY SILT	15		4-E	109	44	76	—	—						8 1/5' 9 1/5' 9 1/5'

\*  
ELEVATION ESTIMATED  
FROM CONTOUR PLAN



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~~Boring~~ Log of cut slope

PROJECT LUNALILO PARK SUBDIVISION UNIT V-A

LOCATION MAUNALUA, OAHU, HAWAII

**HAMMER:**

Weight \_\_\_\_\_

Drop \_\_\_\_\_

**SAMPLER:** \_\_\_\_\_

BORING NO. 4-A Sheet No. 1 of 1

Driller WALTER LUM ASSOC. Date 2-23-67

Field Party MAKAULA, MAKISHI, GLORY

Type of Boring \_\_\_\_\_ Diam. \_\_\_\_\_

Elev. 19' ± \* Datum ---

Drill Bit \_\_\_\_\_

Water Level				
-------------	--	--	--	--

Time	—			
------	---	--	--	--

Date \_\_\_\_\_

### PENTRATION DATA

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA				
										Blows	Per	Foot		
										0	10	20	30	40
	DENSE TANNISH BROWN SANDY SILT W/ GRAVEL & DECOMPOSED ROCK  STIFF, BROWN CLAYEY SILT W/ DECOMPOSED ROCK	0  5  10												

\* ELEVATION ESTIMATED FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-A

LOCATION MAUNALUA, OAHU, HAWAII

TMK: 3-9-05

**HAMMER:**

Weight 10 lb. SLEDGE HAMMER

Drop\_\_\_\_\_

SAMPLER: 2" O.D. THIN WALL TUBE

BORING NO. 5 Sheet No. 1 of 1

Driller WALTER LUM ASSOC. Date 2-28-67

Field Party MAKAULA, CANTORNA, GLORY

Type of Boring AUGER(MOBILE) Diam. 3"

Elev. 14.5' ± \* Datum —

Drill Bit \_\_\_\_\_

Water Level	13.0'				
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Time	11:00 AM				
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Date	2-28-67				
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Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA					
										Blows Per Foot					
										0	10	20	30	40	
ML	MEDIUM TO STIFF BROWN, SILTY CLAY W/ GRAVEL														
ML	STIFF, BROWN SILTY CLAY														
ML	STIFF BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	5		5-A	108	42	76	8330	-					8 1/5' - 14 1/5'	
ML	STIFF TO VERY STIFF YELLOWISH BROWN SILT W/ DECOMPOSED ROCK	10		5-B	95	47	65	-	-					10 1/5' - 20 1/5'	
SM	MEDIUM DENSITY BROWN, SILTY SAND W/ GRAVEL	15		5-C	107	43	75	-	-					7 1/5' - 7 1/5'	
SM	MEDIUM DENSITY DARK GRAY SILTY SAND W/ TRACES OF GRAVEL	20		5-D	113	25	90	-	-					5 1/5' - 8 1/5'	
	MEDIUM DENSITY DARK GRAY, SAND			5-E	(NO RECOVERY)									5 1/5' - 8 1/5'	
	STOPPED BY ROCK OR BOULDER			5-F	-	-	-	-	-					25 1/5'	

\* ELEVATION ESTIMATED FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 6 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 2-28-67Field Party MAKAULA, CANTORNA, GLORYType of Boring AUGER (MOBILE) Diam. 3"Elev. 22' ± \* Datum —Drill Bit —Water Level 15.0'Time 2:00 PMDate 2-28-67

## PENETRATION DATA

2" O.D. THIN  
WALL TUBE  
SAMPLER,  
BLOWS/0.5'  
W/ 10 lb. SLEDGEBlows Per Foot  
0 10 20 30 40

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot						
										0	10	20	30	40		
MH	MEDIUM TANNISH BROWN SILTY CLAY			6-A	90	32	68	—	—						5/5'	5/5'
MH	VERY STIFF MOTTLED BROWN SILTY CLAY W/ DECOMPOSED ROCK	5		6-B	101	37	74	12,500	—						20/5'	20/5'
ML	STIFF TO VERY STIFF YELLOWISH BROWN SANDY SILT W/ DECOMPOSED ROCK			6-C	91	48	61	—	—						10/5'	23/5'
ML	MEDIUM TO STIFF LIGHT BROWN SANDY SILT W/ TRACES OF GRAVEL	10		6-D	98	71	58	3130	—						6/5'	10/5' 15/5'
	DENSE GRAY SAND W/ TRACES OF GRAVEL	15	W.L.	6-E	119	28	93	—	—						16/5'	16/5'

\*  
ELEVATION ESTIMATED  
FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop -SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 7 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 3-1-67Field Party MAKAULA, CANTORNA, GLORYType of Boring AUGER (MOBILE) Diam. 3"Elev. 31.5' ± \* Datum -Drill Bit -Water Level NOT ENCOUNTEREDTime -Date 3-1-67

## PENETRATION DATA

2" O.D. THIN  
WALL TUBE  
SAMPLER  
BLOWS/0.5'  
W/10 lb. SLEDGE  
HAMMER

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blooms Per Foot	0	10	20	30	40
ML	MEDIUM, BROWN CLAYEY SILT	0	ELEV. = 31.5' ± 7	7-A	117	28	91	-	-						
MH	MEDIUM TO STIFF MOTTLED TANNISH BROWN SILTY CLAY W/ DECOMPOSED ROCK	5		7-B	-	19	-	-	-						
				7-C	109	32	83	13,000+	-						
MH	VERY STIFF TANNISH BROWN SILTY CLAY	10		7-D	97	37	71	13,000+	-						
	DENSE GRAYISH BROWN GRAVELLY SAND	15		7-E	-	6	-	-	-						

\* ELEVATION ESTIMATED  
FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ABORING NO. 8 Sheet No. 1 of 1LOCATION MAUNALUA, OAHU, HAWAIIDriller WALTER LUM ASSOC. Date 2-28-67TMK: 3-9-05Field Party MAKAULA, OSHIRO, GLORYType of Boring AUGER (MOBILE) Diam. 3"Elev. 30' ± \* Datum —

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —Drill Bit —Water Level NOT ENCOUNTEREDTime —SAMPLER: 2" O.D. THIN WALL TUBEDate 2-28-67

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA					Blows Per Foot	2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' w/10 lb. SLEDGE HAMMER
										0	10	20	30	40		
MH	MEDIUM, BROWN CLAYEY SILT w/SAND			8-A	86	48	58	—	—							4 1/5' 5 1/5'
MH	STIFF MOTTLED TANNISH BROWN SILTY CLAY	5		8-B	105	36	77	13,000+	—							6 1/5' 18 1/5'
				8-C	101	31	77	—	—							25 1/5'
MH	STIFF TO VERY STIFF TANNISH BROWN SILTY CLAY	10		8-D	99	49	67	4950	—							20 1/5' 35 1/5'

\* ELEVATION ESTIMATED FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-A

LOCATION MAUNALUA, OAHU, HAWAII

TMK: 3-9-05

HAMMER:

Weight 10 lb. SLEDGE HAMMER

Drop.

SAMPLER: 2" O.D. THIN WALL TUBE

BORING NO. 9 Sheet No. 1 of 1

Driller WALTER LUM ASSOC. Date 3-2-67

Field Party MAKAULA, CANTORNA, MEYERS

Type of Boring AUGER (MOBILE) Diam. 3"

Elev. 37' ± \* Datum —

Drill Bit \_\_\_\_\_

Water Level	NOT ENCOUNTERED		
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[illegible]

Date	3-2-67				
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Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENTRATION DATA					2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' W/10 LB. SLEDGE HAMMER																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
										Blows	Per Foot	0	10	20		30	40																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 10 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 3-2-67Field Party MAKAULA, CANTORNA, MEYERSType of Boring AUGER (MOBILE) Diam. 3"Elev. 31 ± \* Datum —Drill Bit —Water Level NOT ENCOUNTEREDTime —Date 3-2-67

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA					Blows Per Foot	2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' W/ 10 lb. SLEDGE HAMMER
										0	10	20	30	40		
MH	MEDIUM TO STIFF MOTTLED BROWN SILTY CLAY W/ DECOMPOSED ROCK	5		10-A	126	38	91	5200	—							5/5' 9/5'
				10-B	121	34	91	11700	—							7/5' 13/5'
				10-C	96	33	72	13,000	—							6/5' 14/5'
SM	VERY STIFF YELLOWISH BROWN SILTY SAND W/ DECOMPOSED ROCK & GRAVEL	10		10-D	85	33	64	—	—							20/5' 23/5'
	DENSE, GRAY GRAVELLY SAND W/ DECOMPOSED ROCK															
ML	STIFF GRAYISH BROWN SANDY SILT W/ DECOMPOSED ROCK & GRAVEL	15		10-E	112	13	98	—	—							10/5' 12/5'

\*  
ELEVATION ESTIMATED  
FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop -SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 11 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 3-1-67Field Party MAKAULA, CANTORNA, GLORIAType of Boring AUGER (MOBILE) Diam. 3"Elev. 50± \* Datum -Drill Bit -Water Level NOT ENCOUNTEREDTime -Date 3-1-67

## PENETRATION DATA

2" O.D. THIN  
WALL TUBE  
SAMPLER  
BLOWS/0.5'  
W/10 lb. SLEDGE  
HAMMERBlows Per Foot  
0 10 20 30 40

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot	Blows Per Foot	Blows Per Foot	Blows Per Foot	Blows Per Foot
										0	10	20	30	40
MH	MEDIUM, BROWN CLAYEY SILT			11-A	100	27	79	-	-					
MH	MEDIUM MOTTLED BROWN SILTY CLAY W/DECOMPOSED ROCK	5		11-B	96	19	81	-	-					
				11-C	93	30	71	-	-					
MH	VERY STIFF TANNISH BROWN SILTY CLAY	10		11-D	98	29	76	-	-					
	DENSE GRAYISH BROWN GRAVELLY SAND	15		11-E	-	9	-	-	-					

\*  
ELEVATION ESTIMATED  
FROM CONTOUR PLAN



## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop -SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 12 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 2-24-67Field Party MAKAULA, GLORY, CADUYAType of Boring AUGER (McCULLOCH) Diam. 3"Elev. 54' ± \* Datum -Drill Bit -Water Level NOT ENCOUNTEREDTime -Date 2-24-67

## PENETRATION DATA

2" O.D. THIN  
WALL TUBE  
SAMPLER  
BLOWS/0.5'  
W/10 lb. SLEDGE  
HAMMER

Unified Soil Classification	DESCRIPTION	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot	0	10	20	30	40	
		ELEV. = 54 ± *													
MH	MEDIUM, BROWN SILTY CLAY W/ DECOMPOSED ROCK		12-A	104	23	84	-	-							4 1/5' - 7 1/5'
			12-B	112	32	85	13,000	-							7 1/5' - 13 1/5'
MH	STIFF TO VERY STIFF MOTTLED TANNISH BROWN SILTY CLAY W/ DECOMPOSED ROCK		12-C	106	33	79	8850	-							9 1/5' - 13 1/5'
			12-D	112	38	81	-	-							25 1/5'
	DENSE DARK GRAY GRAVELLY SAND		12-E	109	7	102	-	-							12 1/5' - 13 1/5'

\* ELEVATION ESTIMATED  
FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 13 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 3-1-67Field Party MAKAULA, MAKISHI, GLORYType of Boring AUGER (McCULLOCH Diam. 3" & MOBILE)Elev. 62.5' ± \* Datum —Drill Bit —Water Level NOT ENCOUNTEREDTime —Date 3-1-67

## PENETRATION DATA

2" O.D. THIN  
WALL TUBE  
SAMPLER  
BLOWS/0.5'  
W/10 lb. SLEDGE  
HAMMERBlows Per Foot  
0 10 20 30 40

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot	Blows/0.5'
										0 10 20 30 40	
SM	MEDIUM DENSITY TANNISH BROWN SILTY SAND W/ DECOMPOSED ROCK			13-A	91	20	76	—	—		4/5, 5/5'
SM	DENSE TANNISH BROWN SILTY SAND W/ DECOMPOSED ROCK & GRAVEL	5		13-B	99	21	82	—	—		12/5, 10/5'
	MOTTLED BROWN DECOMPOSED ROCK			13-C	92	28	71	—	—		11/5, 20/5'
ML	VERY STIFF YELLOWISH BROWN SANDY SILT W/ DECOMPOSED ROCK	10		13-D	—	22	—	—	—		19/5, 21/5'
	MOTTLED TANNISH BROWN DECOMPOSED ROCK	15		13-E	89	35	66	5990	—		40/5'

\*  
ELEVATION ESTIMATED  
FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAII

TMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 14 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 2-28-67Field Party MAKAULA, CANTORNA, GLORYType of Boring AUGER (MOBILE) Diam. 3"Elev. 70 ± \* Datum —Drill Bit —Water Level NOT ENCOUNTEREDTime —Date 2-28-67

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA					2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' W/10 lb. SLEDGE HAMMER
										Blows Per Foot					
										0	10	20	30	40	
MH	MEDIUM, BROWN CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK			14-A	111	37	81	3120	-						2/5', 4/5'
MH	MEDIUM TO STIFF TANNISH BROWN SILTY CLAY W/ DECOMPOSED ROCK	5		14-B	101	41	72	3650	-						4/5', 8/5'
MH	VERY STIFF TANNISH BROWN SILTY CLAY W/ DECOMPOSED ROCK	10		14-C	103	39	74	-	-						5/5', 10/5'
	STIFF DARK GRAYISH BROWN SANDY SILT W/ GRAVEL	15		14-E	104	7	97	-	-						10/5', 13/5'

\* ELEVATION ESTIMATED FROM CONTOUR PLAN

\* ELEVATION ESTIMATED FROM CONTOUR PLAN

## Boring Log

PROJECT LUNALILO PARK SUBDIVISION UNIT V-ALOCATION MAUNALUA, OAHU, HAWAIITMK: 3-9-05

## HAMMER:

Weight 10 lb. SLEDGE HAMMERDrop —SAMPLER: 2" O.D. THIN WALL TUBEBORING NO. 15 Sheet No. 1 of 1Driller WALTER LUM ASSOC. Date 3-1-67Field Party MAKAULA, RACUYA, GLORYType of Boring Auger (McCulloch & Mobile) Diam. 3"Elev. 72' ± \* Datum —Drill Bit —Water Level NOT ENCOUNTEREDTime —Date 3-1-67

## PENETRATION DATA

Unified Soil Classification	DESCRIPTION	Depth (ft.)	Elev.	Sample No.	Wet Dens. P.C.F.	Moist. Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	Blows Per Foot					2" O.D. THIN WALL TUBE SAMPLER BLOWS/0.5' W/10 lb. SLEDGE HAMMER
										0	10	20	30	40	
MH	MEDIUM, BROWN SANDY SILT W/DECOMPOSED ROCK			15-A	90	25	72	—	—						4 1/5' 3 1/5'
				15-B	100	23	81	—	—						7 1/5' 12 1/5'
	MEDIUM TO STIFF MOTTLED TANNISH BROWN SILTY CLAY W/DECOMPOSED ROCK	5		15-C	97	25	78	—	—						8 1/5' 14 1/5'
ML				15-D	122	28	95	13,000+	—						45 1/5'
	VERY STIFF YELLOWISH BROWN SANDY SILT W/DECOMPOSED ROCK	10		15-E	97	30	74	—	—						25 1/5'
		15													

\*  
ELEVATION ESTIMATED  
FROM CONTOUR PLAN

LUNALILO PARK SUBDIVISION UNIT V-A  
MAUNALUA, OAHU, HAWAII

TABLE I-A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	3	3	4	5	5
SAMPLE NO.	3-B	3-C	4-E	5-A *	5-C
DEPTH BELOW SURFACE	3'-4'	6'-7'	15'-16.5'	SURFACE	6'-7'
DESCRIPTION	YELLOWISH BROWN SANDY SILT W/ DECOMPOSED ROCK	LIGHT BROWN SILT W/ TRACES OF DECOMPOSED ROCK	LIGHT GRAYISH BROWN SANDY SILT	BROWN CLAYEY SILT W/ DECOMPOSED ROCK	BROWN SILTY SAND W/ GRAVEL
<b>GRADING ANALYSIS</b>					
(% Passing)					
Sieve					
1"			100		100
½"			100		97.6
#4			98.4		93.7
#10			96.5		83.3
#20			93.7		74.4
#40			91.3		69.2
#100			88.3		57.1
#200			84.4		43.4
<b>ATTERBERG LIMITS</b>					
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	—	—	—	60	—
Plastic Limit	NON-PLASTIC	NON-PLASTIC	NON-PLASTIC	42	NON-PLASTIC
Plasticity Index	—	—	—	18	—
Dilatancy	VERY QUICK	VERY QUICK	VERY QUICK	SLOW-MED	VERY QUICK
Toughness	VERY SLIGHT	VERY SLIGHT	VERY SLIGHT	MEDIUM	VERY SLIGHT
Dry Strength	VERY SLIGHT	VERY SLIGHT	VERY SLIGHT	—	VERY SLIGHT
<b>UNIFIED SOIL CLASSIFICATION</b>					
	ML	ML	ML	MH	SM
<b>SPECIFIC GRAVITY</b>					
	—	—	—	2.99	—
<b>EXPANSION AND CBR TESTS</b>					
(Surcharge-51 P.S.F.)					
Molding Moisture Content, %				34.1	
Molding Dry Density, P.C.F.				81.2	
Swell upon saturation, %				4.6	
CBR at 0.1" Penetration (%)				3.3	
<b>COMPACTION TEST</b>					
(AASHTO T-180-57 Method A)				A	
Dry to Wet or Wet to Dry				DRY TO WET	
Max. Dry Density (P.C.F.)				84.0	
Optimum Moisture (%)				37.0	

\*  
DISTURBED SURFACE SAMPLE  
TAKEN ADJACENT TO BORING

**WALTER LUM ASSOCIATES**  
CIVIL, STRUCTURAL, SOILS ENGINEERS

LUNALILO PARK SUBDIVISION UNIT V-A  
MAUNALUA, OAHU, HAWAII

TABLE I-B - SUMMARY OF LABORATORY TEST RESULTS

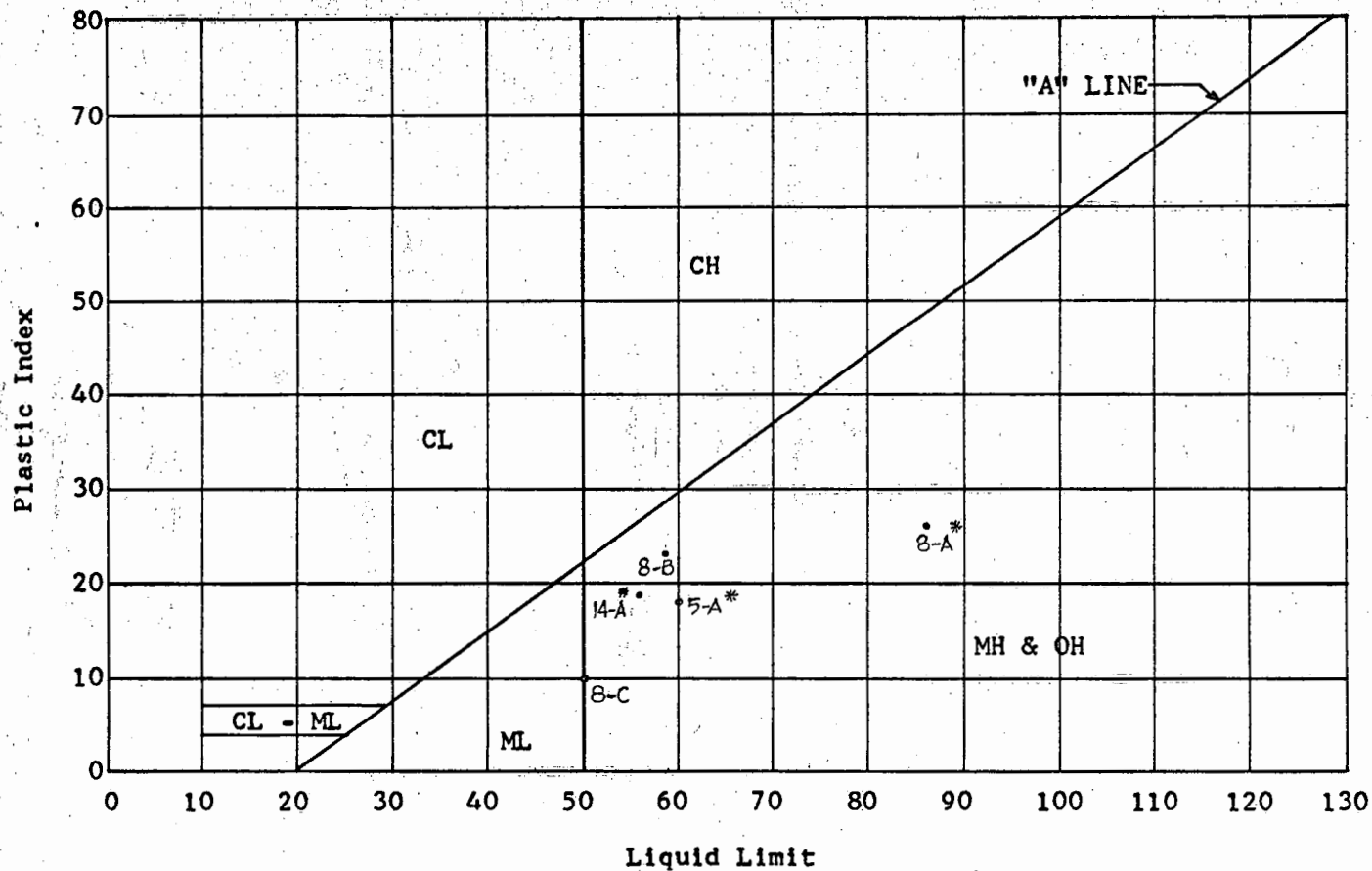
BORING NO.	8	8	8	10	14
SAMPLE NO.	8-A*	8-B	8-C	10-D	14-A*
DEPTH BELOW SURFACE	SURFACE	3'-4'	6'-6.5'	9'-10'	SURFACE
DESCRIPTION	BROWN CLAYEY SILT W/ SAND	MOTTLED TANNISH BROWN SILTY CLAY	TANNISH BROWN SILTY CLAY	YELLOWISH BROWN SILTY SAND W/ GRAVEL & DECOMPOSED ROCK	BROWN CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK
<b>GRADING ANALYSIS</b>					
(% Passing)					
Sieve					
1"	100			100	
1/2"	100			100	
#4	97.9			94.8	
#10	96.2			90.3	
#20	93.5			82.3	
#40	90.7			70.5	
#100	85.2			51.2	
#200	78.9			41.0	
<b>ATTERBERG LIMITS</b>					
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	86	59	50	—	55
Plastic Limit	60	35	40	NON-PLASTIC	36
Plasticity Index	26	24	10	—	19
Dilatancy	MEDIUM	VERY SLOW	SLOW	VERY QUICK	MEDIUM
Toughness	SLIGHT-MED	MEDIUM	SLIGHT-MED.	VERY SLIGHT	MEDIUM
Dry Strength	SLIGHT	SLIGHT-MED.	SLIGHT-MED.	VERY SLIGHT	—
<b>UNIFIED SOIL CLASSIFICATION</b>					
	MH	MH	MH	SM	MH
<b>SPECIFIC GRAVITY</b>					
	2.51	—	—	—	2.84
<b>EXPANSION AND CBR TESTS</b>					
(Surcharge-51 P.S.F.)					
Molding Moisture Content, %	48.3				29.6
Molding Dry Density, P.C.F.	66.1				89.1
Swell upon saturation, %	1.4				1.4
CBR at 0.1" Penetration (%)	7.0				14.0
<b>COMPACTION TEST</b>					
(AASHTO T-180-57 Method A)	A				A
Dry to Wet or Wet to Dry	WET TO DRY				WET TO DRY
Max. Dry Density (P.C.F.)	68.1				95.0
Optimum Moisture (%)	48.0				25.5

\* DISTURBED SURFACE SAMPLE  
TAKEN ADJACENT TO BORING

**WALTER LUM ASSOCIATES**  
CIVIL, STRUCTURAL, SOILS ENGINEERS

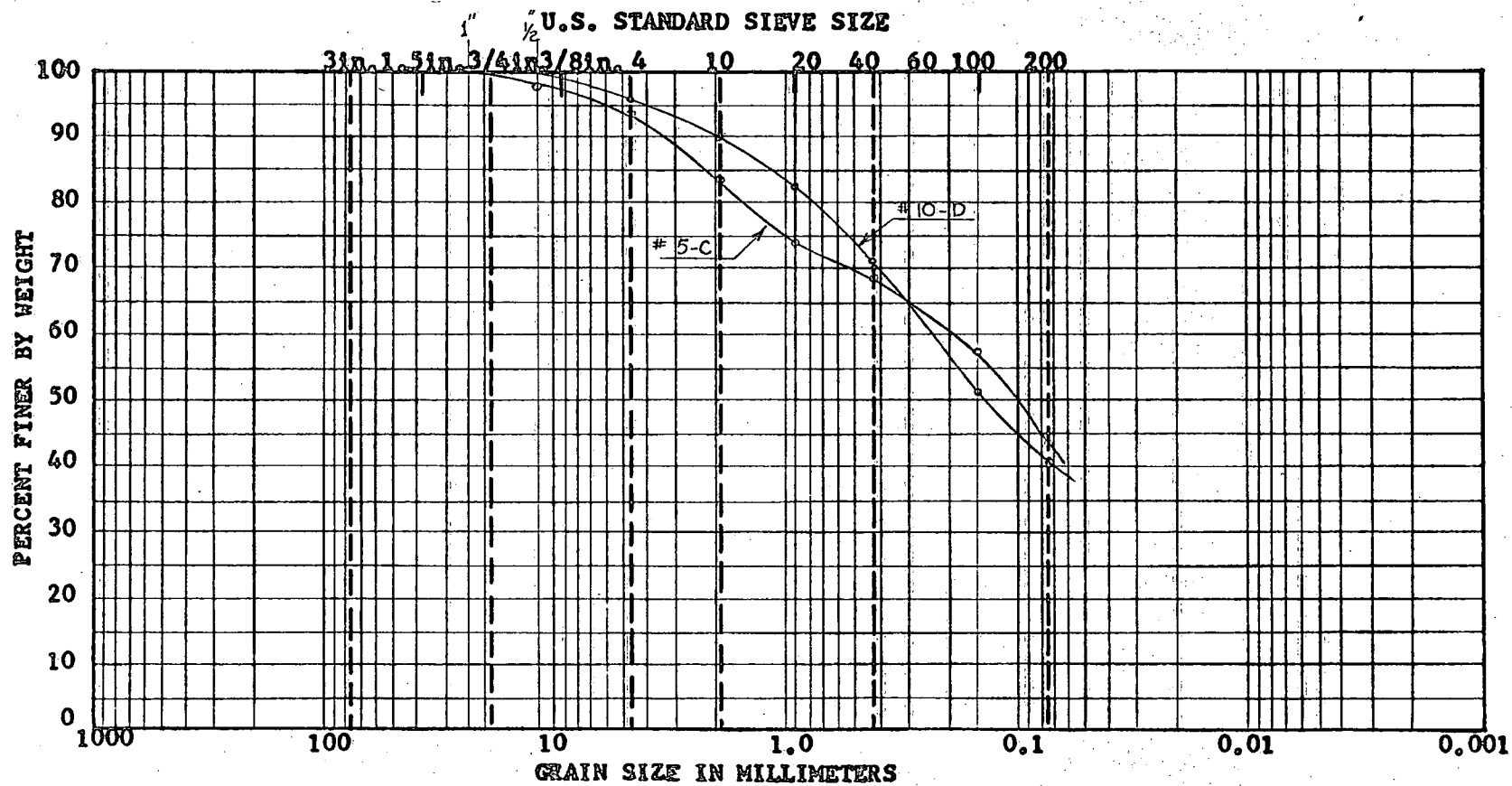
JOB: LUNALILO PARK SUBDIVISION UNIT V-A

LOCATION: MAUNALUA , OAHU , HAWAII



PLASTICITY CHART

\* DISTURBED SURFACE SAMPLE  
TAKEN ADJACENT TO BORING



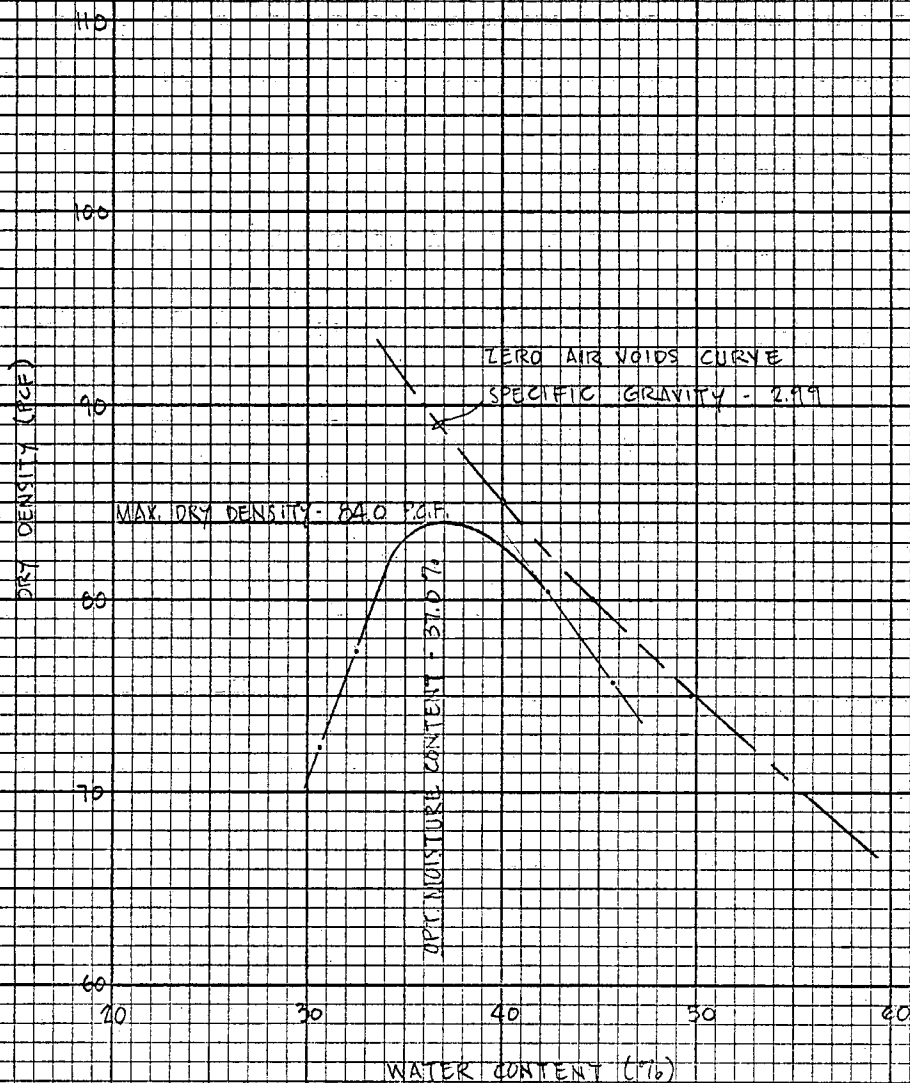
COBBLES	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COARSE	MEDIUM	FINE	

GRADATION CURVE

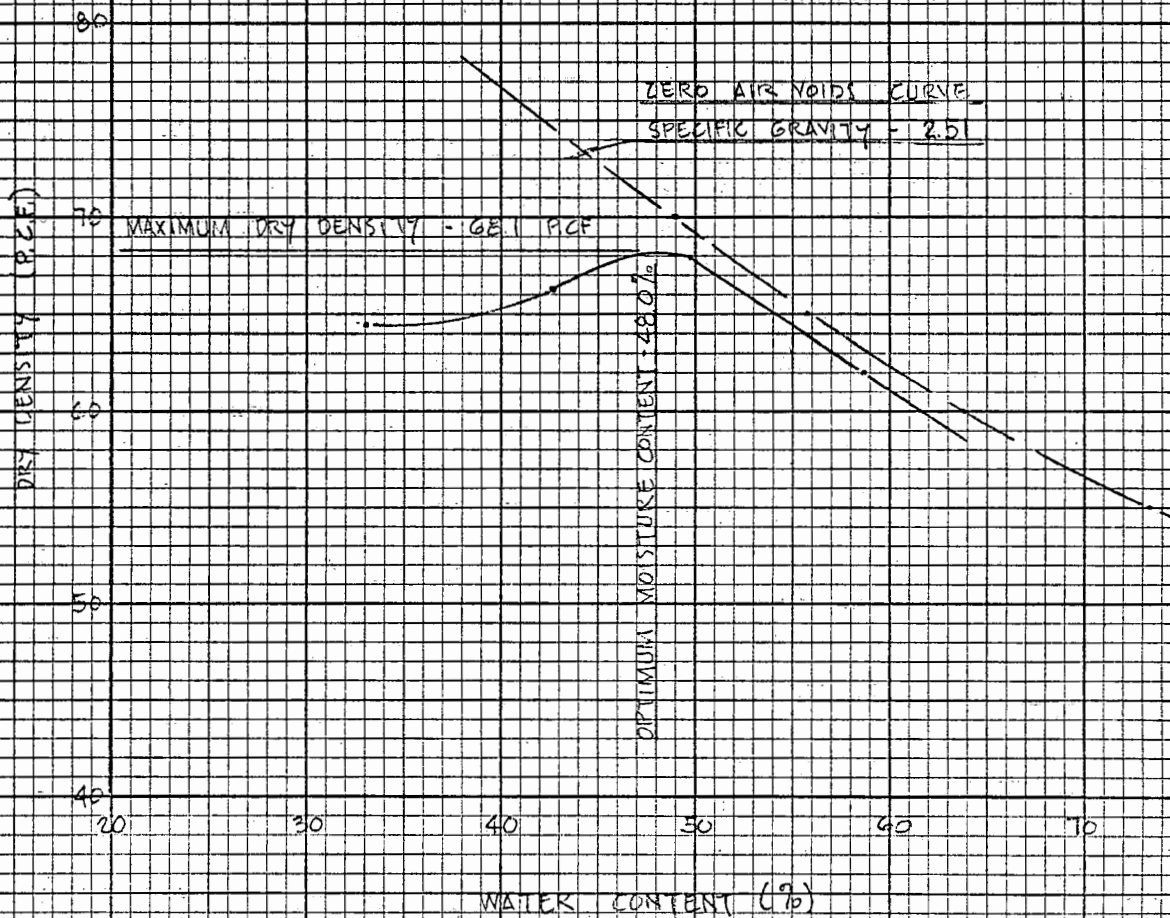
LUNALILO PARK SUBDIVISION UNIT V-A  
MAUNALUA, OAHU, HAWAII



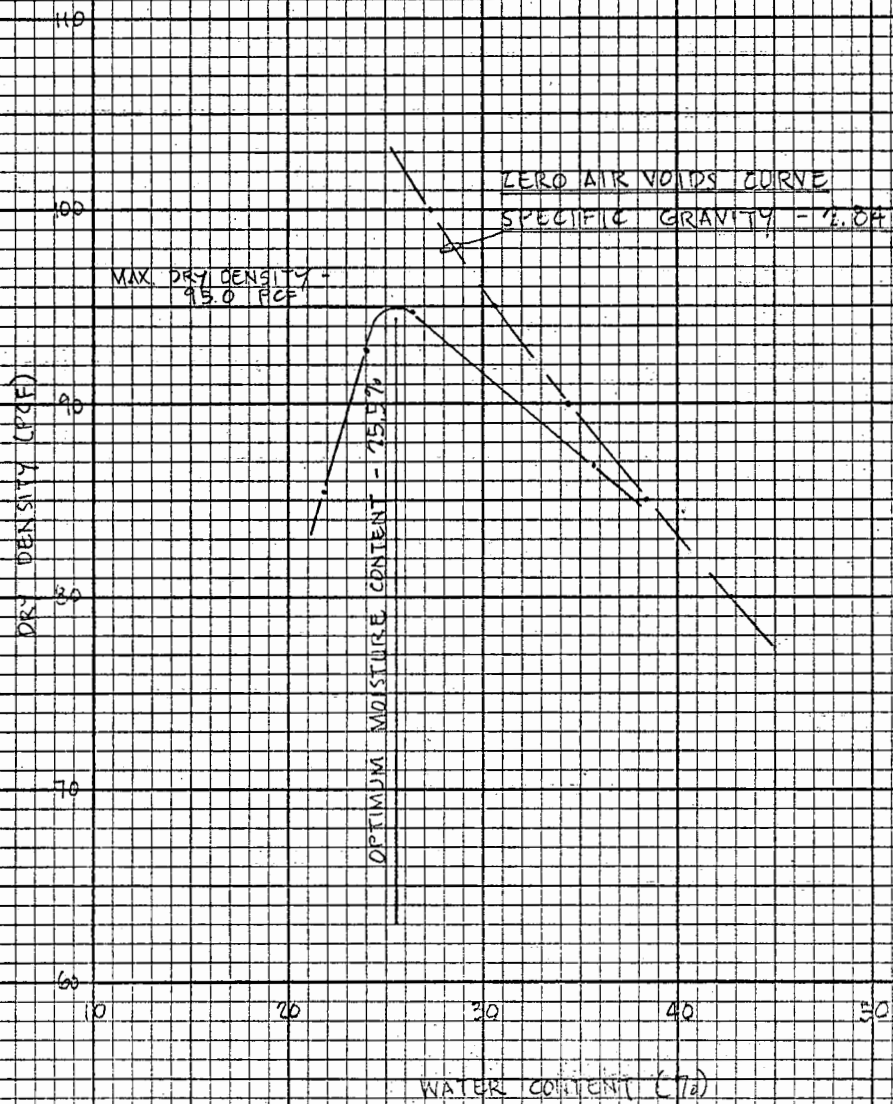
LUNALILO PARK SUBDIVISION - UNIT V-A  
MOISTURE-DENSITY CURVE (AASHTO T-180-57 METHOD A)  
SAMPLE NO: 5 SURFACE  
SAMPLE DESCRIPTION: BROWN CLAYEY SILT W/DECOMPOSED ROCK



LINALILO PARK SUBDIVISION - UNIT VEA  
MOISTURE-DENSITY CURVE (AASHTO T-99-57 METHOD A)  
SAMPLE NO: 8 SURFACE  
SAMPLE DESCRIPTION: BROWN CLAYEY SILT W/SAND



LUNALILO PARK SUBDIVISION - UNIT V-A  
MOISTURE-DENSITY CURVE (AASHTO T-100-51 METHOD A)  
SAMPLE NO: 14 SURFACE  
SAMPLE DESCRIPTION: BROWN CLAYEY SILT W/ TRACES OF DECOMP. ROCK



## GENERAL TESTING METHODS

### EXPLORATORY BORINGS AND SAMPLING

Method for soil investigation and sampling  
by auger borings (Tentative)

ASTM Designation: D 1452-63T

Method for thin wall tube sampling of  
soils (Tentative)

ASTM Designation: D 1587-63T

Method for penetration test and split  
barrel sampling of soils (Tentative)

ASTM Designation: D 1586-64T

### LABORATORY TESTING

#### Grading Analysis

Sieve analysis of fine and coarse  
aggregates

AASHTO Designation: T 27-60

Amount of material finer than  
No. 200 sieve in aggregate

AASHTO Designation: T 11-60

#### Atterberg Limits

Determining the liquid limit of soils  
Modified as follows: Substitute  
Casagrande grooving tool. Tests  
conducted from natural moisture  
content unless noted otherwise.

AASHTO Designation: T 89-60

Determining the plastic limit of soils

AASHTO Designation: T 90-56

Calculating the plasticity index of  
soils

AASHTO Designation: T 91-54

#### Specific Gravity

Specific gravity of soils  
Modified as follows: 500 ML Pycnometer

AASHTO Designation: T 100-60

#### Expansion and CBR Tests

Expansion test and California Bearing  
Ratio (CBR)

Section VIII - TM 5-530  
"Materials Testing" by Headquarters,  
Dept. of the Army

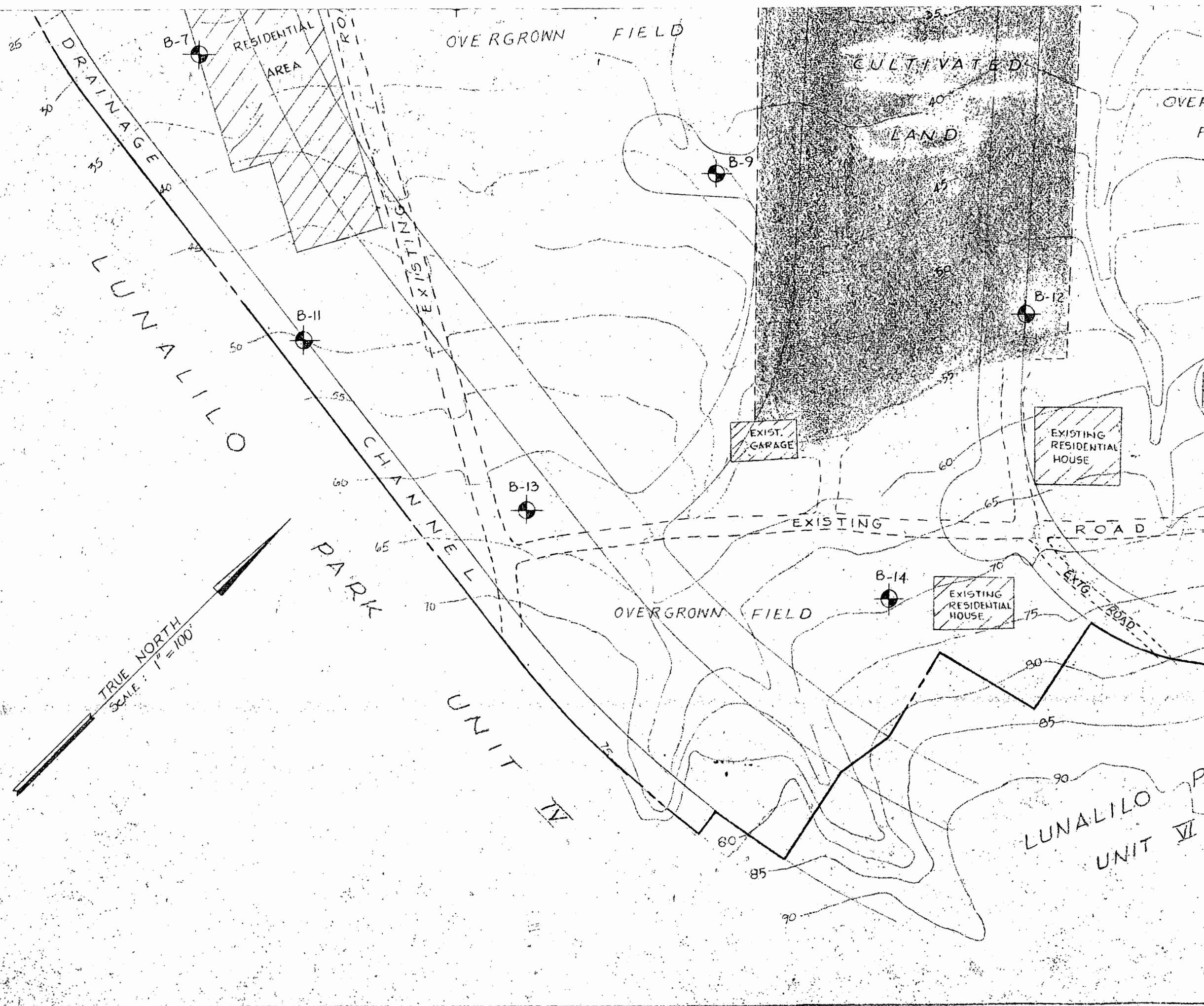
#### Compaction Test

Moisture-Density relations of soils  
using a 10# rammer and an 18" drop

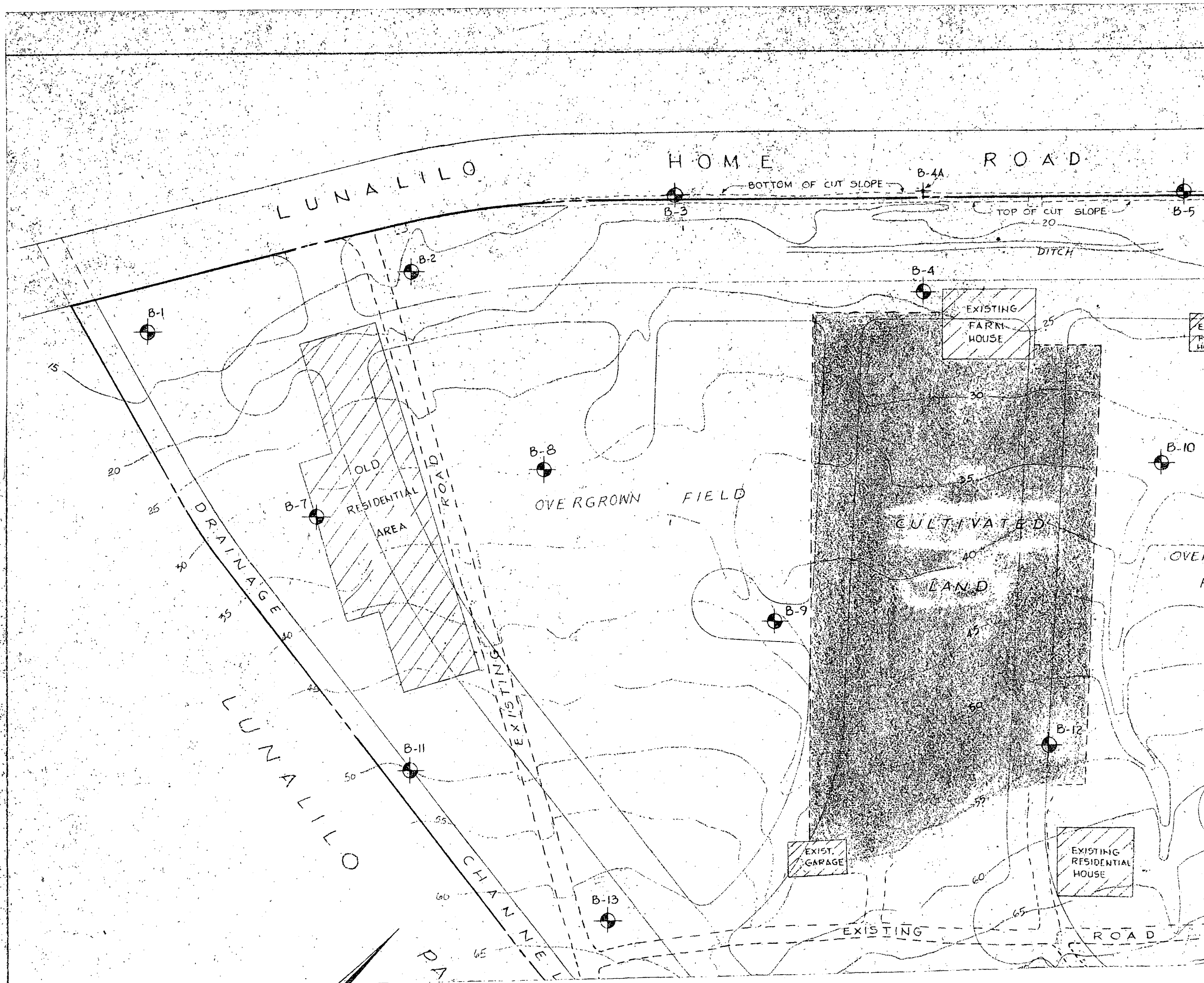
AASHTO Designation: T 180-57

#### Unified Soil Classification

Designation E-3 from "Earth  
Manual" by the United States  
Department of the Interior  
Bureau of Reclamation







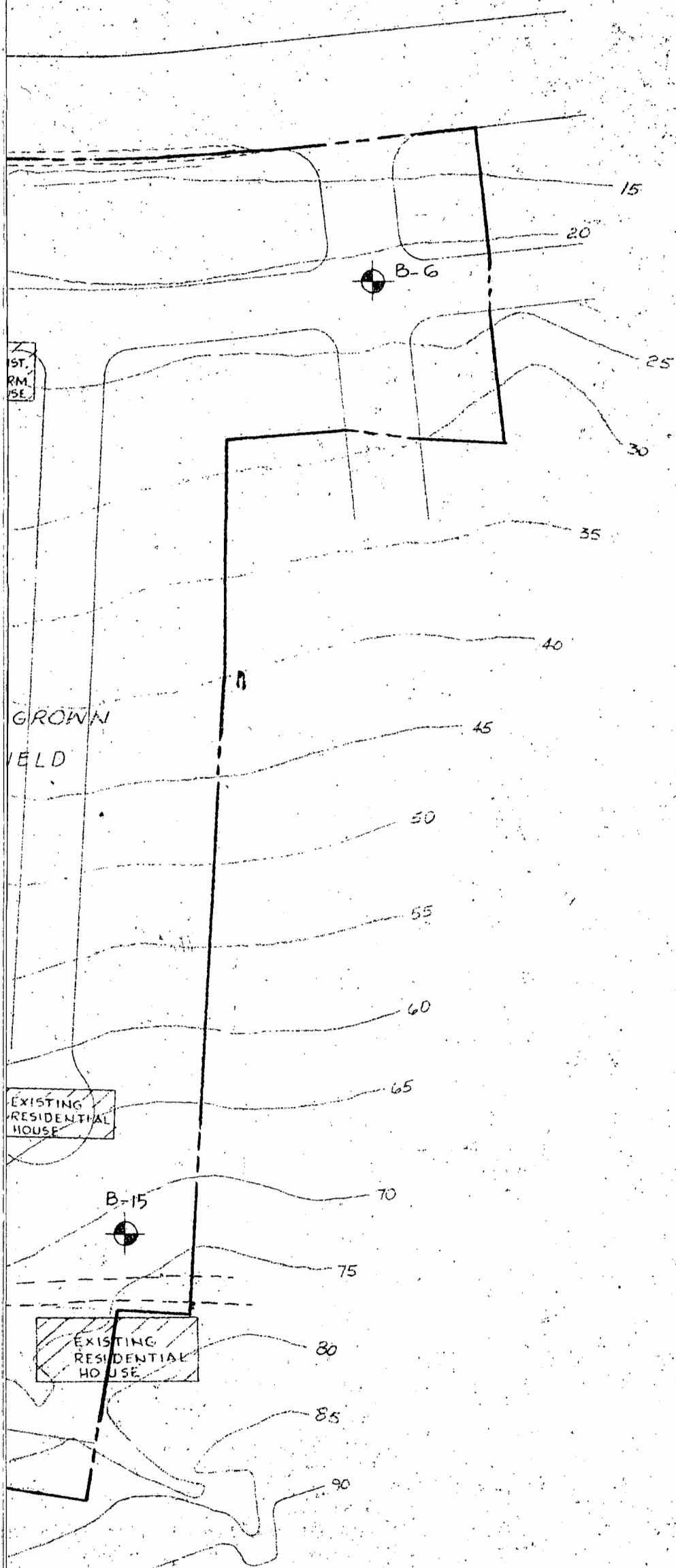


FIGURE 1

BORING LOCATION PLAN

LUNALILO PARK SUBDIVISION UNIT V-A

MAUNALOA, OAHU, HAWAII

TAX MAP KEY: 3-9-05

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APRIL, 1967